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DESIGN DEVELOPMENT AND TESTING OF DOG-BITE TRACKING SYSTEM

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ABSTRACT

Animal bites, especially those resulting in rabies, continue to be a significant public health problem in rural and urban settings because of inadequate documentation, disjointed reporting systems, and poor access to prompt treatment. The purpose of this study is to develop and test an information management and monitoring system for animal bites to enhance documentation, surveillance, and response. This Study utilized a descriptive-developmental study design maximizing Iterative Development Model together with document analysis, key informant interviews, and system prototyping. Instrument employed were questionnaires grounded on ISO 25011: standards to evaluate the quality of the system, The Indicators of the UTAUT and purposive sampling to choose between health workers and system assessors.

Keywords: *(Data Analytics, Decision Support, Disease surveillance, ISO 25010, Rabies, TAM)*

INTRODUCTION

Cagayan Province has a consistently very high incidence of animal bite cases, most of which are dog bites, that often is the 1st or 2nd province in the country in recent years (e.g., 2022, 2023) for the absolute number of patients who go to Animal Bite Treatment Centers (ABTCs) for Post-Exposure Prophylaxis (PEP). This is expressed in high absolute figures, if not necessarily the highest per capita rate. Contributing to it are its sizeable human and dog population (with numerous roaming dogs), its largely rural environment, high public sensitivity to rabies risk so prevalence of seeking PEP following any exposure, and active rabies transmission in some areas. Being a large, largely rural town in Cagayan province, Baggao is by nature part of this high-incidence provincial pattern. It has the major risk factors: a large human population, intense agricultural use, and a probable high dog population with free-roaming animals. While the Baggao Municipal Health Office (MHO) and Municipal Agriculture Office (MAO) do have local data on animal bites (for administration of PEP) and rabies surveillance (monitoring animal cases and vaccination activities), such particular data at the municipal level is reported up to the Provincial Health Office (PHO) and Provincial Veterinary Office (PVO) and not regularly published or publicly disseminated for Baggao specifically.

With these conditions, the Local Government Unit (LGU) of Baggao, similar to other municipalities that are high-risk, aims for the eradication of rabies and prevention of animal bites. Large-scale efforts are the implementation of Mass Dog Vaccination (MDV) campaigns to maintain and ensure a coverage rate of more than 70% in order to break rabies' transmission cycles effectively. At the same time, Responsible Pet Ownership (RPO) campaigns are implemented, which encourage the registration, leashing, and confinement of dogs. But during our visit to Baggao in order to gather data for the system, it was observed that quite a lot of dogs still roamed around the

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town.Baggao is also still employing a log book system to record animal bite incidences, which is a laborious and repeated operation that can lead to data redundancy, data inaccuracy, and paper heavy processes that can be costly, as well as time demanding for staff and patients. The DESIGN DEVELOPMENT AND TESTING OF DOG-BITE TRACKING SYSTEM eliminates the paper intensive process by fully utilizing the digital process of storing a patients'. It also solves the data redundancy and inaccuracy because the system has error handling process to validate the data. It is also less time consuming taking advantage of dropdowns for the sections with set answers.

Objectives of the Study

The objective of this thesis was to establish management solutions that ensured accurate and secure record handling. The study aimed at designing a system that would facilitate good and dependable record-keeping for the municipal health office, with a focus on developing a fast and reliable process. It aimed at maximizing current workflows employed by the office.

Conceptual Framework of the Study

On the basis of input, process, and output variables, the study "Design, Development, and Testing of Dog-Bite Tracking System of Baggao" was conducted. The input includes problems with the current manual record management system, like inconsistent filing, restricted access, and delayed interventions. To guarantee system quality and user approval, the Technology approval Model (TAM) and the ISO 25010:2011 software quality standard serve as guidelines. The Iterative Model is used in the process, which enables ongoing improvement through phases of planning, analysis, design, implementation, testing, and evaluation that are all influenced by input from stakeholders and quality evaluation. The result is a Dog-Bite Tracking System that is effective, precise, and easy to use. Its goals are to enhance data management, facilitate real-time reporting, and assist in making well-informed public health decisions. These components are interconnected; TAM evaluates user perceptions of usefulness and ease of use, ISO 25010 assures technical quality, and system feedback mechanisms guarantee continuous progress.

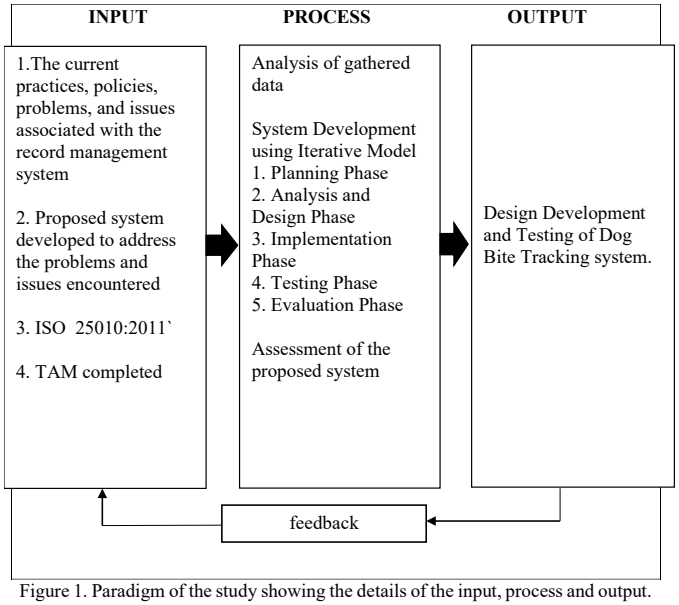

Figure 1. Paradigm of the study showing the details of the input, process and output.

By automating manual records with a computer system, allowing real-time bite recording, reducing human error, and expediting access to post-exposure prophylaxis (PEP), this study significantly increased the operational effectiveness of Municipal Health Offices (MHOs) and Animal Bite Treatment Centers (ABTCs). This allowed healthcare personnel to devote more time to patient care and rabies surveillance. The system provided data-driven features for LGUs, such as bite graph analysis and mapping, which enabled precise identification of rabies hotspots, effective distribution of resources (such as targeted dog vaccination), and compliance with Department of Health (DOH) policies, such as Administrative Order 2022-0004, which equipped local leaders with data-driven information to guide health initiatives.

Due to the system's capacity to reduce reporting delays, simplify recording under stressful situations, and generate responsive

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community awareness based on bite patterns, patients who had been bitten by animals saw quicker access to care. The study is also a significant achievement for the researcher since it expands their area of expertise and creates a chance to foster students' growth and accountability. The study offers future researchers a technically sound model for developing health information systems based on the Technology Acceptance Model (TAM) and ISO 25010 standards (functionality, security, and usability). It uses important adoption metrics like perceived usefulness, effort expectancy, and behavioral intention as a foundation for creating people-oriented digital health solutions in resource-constrained Philippine environments.

A descriptive-analytical research design with a developmental approach was employed in this current study. The aforementioned research design was employed so that there can be an in-depth description of the problems at hand in the management of dog-bite incident records in the municipality of Baggao and so as to lead the systematic development of a dog-bite incident tracking and assessment system responsive to the problems.

The descriptive component of the design was employed to establish and specify the practice, problems, and limitations of the manual system utilized in the local health units. Document survey, questionnaires, and interviews were used to gather data. The goal of this phase was to provide an answer to the question:

"What are the contemporary methods, policies, issues, and challenges related to the record management system in the case of dog-bite?" Descriptive statistics were employed to tabulate and report this data in an organized manner.

Analysis was the step where the data collected was studied to determine the major functional and non-functional system requirements. Data analysis allowed for the determination of some inefficiencies and shortcomings that existed, such as report delays, it being a challenge to get data, and the lack of features that allowed real-time monitoring. It guided the creation of significant features and modules that were core to the new system.

The development strategy was then used in order to design, develop, and deploy the Dog-Bite Tracking System, based on the knowledge gained during the descriptive and analytical phases. The system was deployed using the Iterative Model, which included planning phase, analysis and design phase, implementation phase, testing phase, and evaluation phase.

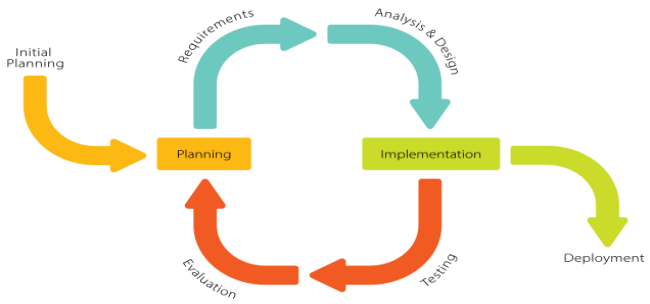

Figure 2 Iterative Software Development Model

Summary of Findings

The Baggao Municipal Health Office (MHO) uses a manual logbook technique to record dog bite cases based on interview responses. Patient data is typed or written in chronological order. This takes a lot of time, is prone to data loss, and isn't tracked in real time, making it challenging to track down and report. Additionally, it is unable to track down individuals who miss their scheduled immunizations. These facts support the need for an automated system that can improve accuracy, combine data, and provide improved patient tracing and public health decisions.

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To satisfy the Municipal Health Office's requirements for effective documentation and monitoring, the Dog Bite Tracking System was created using a methodical methodology. Key elements like patient registration, incident recording, treatment monitoring, and reporting were developed using contemporary web technologies, and an intuitive user interface was created for healthcare professionals. Staff members, IT specialists, and a few chosen patients tested the system using unit tests, functional checks, and user acceptance testing (UAT). Its usability, security, and performance were enhanced via feedback to satisfy operational and reporting requirements.

Table 1. *Summary of Mean for ISO 25010:2011 software quality standards*

ISO Characteristics	Mean	Descriptive Value
Functional Suitability	4.80	Very High Extent
Performance Stability	4.70	Very High Extent
Compatibility	4.50	Very High Extent
Usability	4.40	Very High Extent
Reliability	4.80	Very High Extent
Security	4.33	Very High Extent
Maintainability	4.66	Very High Extent
Portability	4.50	Very High Extent
Overall Weighted Mean	**4.59**	**Very High Extent**

The evaluation based on ISO 25010:2011 is displayed in Table 1 and has an overall mean value of 4.59, indicating high quality. The functionality and reliability category received the highest grade of 4.8, signifying accurate and dependable functioning. In order to guarantee good accessibility, performance (4.7), maintainability (4.66), compatibility, and portability (4.5) were all highly evaluated. A usability rating of 4.4 indicates that it is easy to use, however there is room for little improvement. Despite being the weakest at 4.33, security is strong but requires constant attention. These outcomes verify that the system is deployable and complies with international standards.

Table 2. *Summary of Mean for Technology Acceptance Model evaluation.*

TAM Characteristics	Mean	Descriptive Value
Performance Expectancy	4.90	Strongly Agree
Effort Expectancy	4.80	Strongly Agree
Social Influence	4.57	Strongly Agree
Facilitating Conditions	4.77	Strongly Agree
Behavioral Intention	4.94	Strongly Agree
Perceived Ease of Use	4.68	Strongly Agree
Perceived Usefulness	4.70	Strongly Agree
Self-Efficacy	4.76	Strongly Agree
Response Efficacy	4.76	Strongly Agree
Adoption Intentions	4.80	Strongly Agree
Overall weighted mean	**4.79**	**Strongly Agree**

With a high overall mean of 4.79, Table 6 demonstrates the Dog Bite Tracking System's strong acceptability based on the Technology Acceptance Model (TAM). Performance Expectancy (4.90) is the greatest, indicating that the system increases task efficiency. While Social Influence (4.57) and Facilitating Conditions (4.77) demonstrate robust support and sufficient infrastructure, Effort Expectancy

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(4.80) attests to ease of usage. Strong motivation for consistent use is demonstrated by Behavioral Intention to Use (4.94). The system enhances service delivery, as evidenced by perceived ease of use (4.68) and usefulness (4.70). User trust is demonstrated by Self-Efficacy and Response Efficacy (both 4.76), and readiness to fully transition from manual to digital processes is confirmed by Adoption Intention (4.80).

Conclusion

The successful development, design, and stringent testing of the Dog Bite Tracking System is a beyond doubt proof of its tremendous potential to effectively encourage the documentation, monitoring, and overall administration of animal bites most particularly in the Municipal Health Office. In the automation of data collection and efficiently streamlining the various processes of reporting, the new system directly addresses long-standing issues that plagued the accuracy, efficiency, and crucial need for real-time access of bite information. The active involvement of the MHO personnel, the animal bite patients themselves, and experienced IT professionals in the whole development process were critical in pushing for the system to be specifically tailored to respond to the actual needs of the users and was in perfect consonance with prevailing health protocols. Eventually, the utilization of this system not only significantly enhances the tracking of patients and their treatment follow-up processes but significantly enhances the ability of the municipality to make timely and well-informed decisions on the sustained prevention and effective control of rabies.

Recommendations

Guided by the findings and conclusions drawn from this study, the following are the recommendations provided to enhance further the performance and efficiency of the Record Management System employed to track animal bites at the Municipal Health Office:

1. Regular MHO staff training to raise their digital literacy and correct, consistent system use.

2. Design an offline-capable version of the system to address connectivity limitations in far-off or underserved areas.

3. Assign a dedicated IT support personnel or focal point to manage technical problems, regular maintenance, and the security and stability of the system.

4. Enforce regular data validation and monitoring processes to determine the completeness, accuracy, and timeliness of dog bite incident reports.

5. Encourage collaboration with local government units (LGUs) and barangay officials to enhance wider acceptance and more uniform case reporting within localities.

6. Provide user-friendly documentation and guides that can help assist system users, especially those with minimal technical background, in utilizing the system effectively.

7. Explore partnerships with public health agencies or NGOs to fund further system development and growth at the regional level.

8. For researchers: Expand on the system by adding analytics capability for trend forecasting and real-time case mapping.

9. For future researchers: Research long-term outcomes of digital tracking systems in rabies case mitigation and health improvement in rural areas.

References